

Applicant: Volker BOSCH et al
Docket No. R.306090
Preliminary Amdt.

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-10. (Canceled)

11. (New) A method for starting a sensorless, electronically commutatable direct current motor, having a permanent-magnetically excited rotor and a stator that carries a multi-phase, in particular three-phase stator winding, as well as having a switching device, controlled by a control device, for supplying current in the correct order to the phase windings of the stator from a direct voltage source, the method comprising at rotor standstill and at the onset of the startup operation in the range below a minimum value of the rotor rpm, first the position of the rotor is ascertained by the control device, and then via the switching device, a regulated initial supply of current to the phase windings of the stator is effected, while after the predetermined minimum value of the rotor rpm is attained, the control device receives position signals as rotor position signals for a self-commutation of the motor, which signals are derived directly from the third and/or further odd-numbered harmonics of the phase voltages, and from these position signals furnishes control signals to the switching device for supplying current to the phase windings in normal operation.

12. **(New)** The method as defined by claim 11, wherein rotor standstill, employing the control device to apply current pulses to the phase windings of the stator and, ascertains the resting position of the rotor from the current rise in the individual windings.

13. **(New)** The method as defined by claim 11, wherein the duration and/or the amount of the initial supply of current to the phase windings of the stator is adapted to the load on the motor at the time.

14. **(New)** The method as defined by claim 11, comprising driving the third and/or the further odd-numbered harmonics of the phase voltages of the stator, on the one hand via the star point of the phase windings and on the other via an auxiliary star point, formed of three phase resistors, to a comparator with a downstream integrator.

15. **(New)** The method as defined by claim 12, comprising driving the third and/or the further odd-numbered harmonics of the phase voltages of the stator, on the one hand via the star point of the phase windings and on the other via an auxiliary star point, formed of three phase resistors, to a comparator with a downstream integrator.

16. **(New)** The method as defined by claim 13, comprising driving the third and/or the further odd-numbered harmonics of the phase voltages of the stator, on the one hand via the star point of the phase windings and on the other via an auxiliary star point, formed of three phase resistors, to a comparator with a downstream integrator.

17. **(New)** The method as defined by claim 14, wherein the output signal of the integrator, when the motor is at a standstill and at the onset of the startup operation, is delivered to the control device via an A/D converter and in the range above the predetermined minimum value of the rotor rpm via a comparator with hysteresis.

18. **(New)** The method as defined by claim 11, wherein the control device has a microcontroller, which as input signals receives the signals of an A/D converter, a comparator with hysteresis, and a rated rpm signal, and with its outputs, via a driver stage, it controls a switching device for supplying current to the phase windings of the stator.

19. **(New)** The method as defined by claim 14, wherein the control device has a microcontroller, which as input signals receives the signals of an A/D converter, a comparator with hysteresis, and a rated rpm signal, and with its outputs, via a driver stage, it controls a switching device for supplying current to the phase windings of the stator.

20. **(New)** The method as defined by claim 17, wherein the control device has a microcontroller, which as input signals receives the signals of an A/D converter, a comparator with hysteresis, and a rated rpm signal, and with its outputs, via a driver stage, it controls a switching device for supplying current to the phase windings of the stator.

21. **(New)** The method as defined by claim 11, wherein the control device, once the predetermined minimum value of the rotor rpm is attained, continuously receives binary

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position signals for the rotor-position-dependent self-commutation of the motor via the comparator with hysteresis.

22. **(New)** The method as defined by claim 14, wherein the control device, once the predetermined minimum value of the rotor rpm is attained, continuously receives binary position signals for the rotor-position-dependent self-commutation of the motor via the comparator with hysteresis.

23. **(New)** The method as defined by claim 18, wherein the control device, once the predetermined minimum value of the rotor rpm is attained, continuously receives binary position signals for the rotor-position-dependent self-commutation of the motor via the comparator with hysteresis.

24. **(New)** The method as defined by claim 11, wherein beyond a predeterminable value of the analog rotor position signal furnished by the integrator, between its resting value and an approximately sine-wave oscillation, the enabling of the change from the regulated initial supply of current to the phase windings to the commutation regulation by the flanks of the binary output signal of the comparator with hysteresis is effected, corresponding to the course of the third harmonic of the phase voltages.

25. **(New)** The method as defined by claim 13, wherein beyond a predeterminable value of the analog rotor position signal furnished by the integrator, between its resting value and an

approximately sine-wave oscillation, the enabling of the change from the regulated initial supply of current to the phase windings to the commutation regulation by the flanks of the binary output signal of the comparator with hysteresis is effected, corresponding to the course of the third harmonic of the phase voltages.

26. **(New)** The method as defined by claim 17, wherein beyond a predeterminable value of the analog rotor position signal furnished by the integrator, between its resting value and an approximately sine-wave oscillation, the enabling of the change from the regulated initial supply of current to the phase windings to the commutation regulation by the flanks of the binary output signal of the comparator with hysteresis is effected, corresponding to the course of the third harmonic of the phase voltages.

27. **(New)** The method as defined by claim 11, wherein the enabling of the change from the regulated initial determination of the phase windings to the regulation by the output signal of the comparator with hysteresis is effected upon the attainment of a first turning point of the output signals of the integrator.

28. **(New)** The method as defined by claim 24, wherein the enabling of the change from the regulated initial determination of the phase windings to the regulation by the output signal of the comparator with hysteresis is effected upon the attainment of a first turning point of the output signals of the integrator.

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29. **(New)** The method as defined by claim 11, wherein after the standstill position of the rotor is ascertained, at least two phase windings of the stator are supplied with current at a starting value, such that between the axes of the rotor and stator magnetomotive force, an angle of 30°el. to 150°el., and preferably approximately 90°el., results.

30. **(New)** The method as defined by claim 27, wherein after the standstill position of the rotor is ascertained, at least two phase windings of the stator are supplied with current at a starting value, such that between the axes of the rotor and stator magnetomotive force, an angle of 30°el. to 150°el., and preferably approximately 90°el., results.